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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,174	05/04/2001	Florent Perronnin	9432-000135	9663

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EXAMINER

LAO, TIM P

ART UNIT PAPER NUMBER

2655

DATE MAILED: 11/24/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/849,174

Applicant(s)

PERRONNIN ET AL.

Examiner

Tim Lao

Art Unit

2655

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "said offsets" in the 6th ¶. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-5, and 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuhn et al. [1], (US Patent No. 6,571,208) in view of Kuhn et al. [2], ("Rapid speaker adaptation in eigenvoice space," November, 2000) and Padmanabhan et al., ("Speaker clustering and transformation for speaker adaptation in speech recognition systems", January, 1998).

Regarding claim 1, Kuhn et al. [1] disclose:

A method for developing context dependent acoustic models, comprising the steps of:

developing a low-dimensional space (K-space) from training speech data obtained from a plurality of training speakers (Fig.2, 20-26; col. 4, L.50-68; col.5, L.1-33);

representing said speaker dependent component as centroids (Fig.1; col.5, L.34-40) within said low-dimensional space (Fig.2, 28; col.5, L.34-40); [The centroids are speaker-dependent components of the training speech data (col.4, L.11-14; col.9, L.12-13).]

representing said speaker independent component (speaker-adjusted acoustic data) as linear transformations of said centroids (Fig.2, 30); [First, context-independent implies speaker-dependent (col.1, L.39-40) and context-dependent implies speaker-independent (col.3, L.3-4). Next, the allophone-relevant data (speaker-adjusted data), the result of the centroid subtraction process, is context-dependent, speaker-independent (col.1, L.21-37; col.7, L.45-51). Finally, the linear transformation of centroids is met by the centroid subtraction process (col.8, L.14-30). Therefore, it can be deduced that linear transformation of centroids (speaker-adjusted data) represents the speaker-independent (context-dependent) component of the training speech data.]

representing the training speech data from each of said plurality of training speakers as the combination of a speaker dependent component (centroids) and a speaker independent component (speaker-adjusted data). This is shown in Fig. 1 and Fig.2, 16, 28, 30. [Since the subtraction of the speaker-dependent component

(centroids) from the training speech data yields the speaker-independent component (speaker-adjusted data), it can be deduced that the training speech data represents a combination of a speaker-dependent component and a speaker-independent component.]

Kuhn et al. [1] show that the centroid vector consists of the concatenated Gaussian mean vectors (col.3, L. 37-44) but do not show the maximum likelihood re-estimation on said training speech data of at least one of said low-dimensional space, said centroids, and said offsets to represent context dependent acoustic model.

However, Kuhn et al. [2] teach:

maximum likelihood estimation of centroids (Fig.1, "ONLINE STEPS"; sect. C, p.697; sect. D, p.698-699); and

maximum likelihood re-estimation of centroids (Fig.1, "ONLINE STEPS"; p.697, col.1, L.9-10 of 1st ¶; p.697, col.2, the ¶ after equation 8). [The re-estimation process of centroids is performed by iterative estimation of centroids.]

Padmanabhan et al. teach:

maximum likelihood re-estimation of offset (linear transformed data or adjusted-speaker data). See Fig. 1, "Re-estimation of Gaussians"; p.74, col.1, sect. D. [The linear transformation of the speech data corresponds to the context-dependent component (offset or adjusted-speaker data).]

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method for developing context-dependent acoustic model of Kuhn et al. [1] to include the maximum likelihood re-estimation on the

centroids of Kuhn et al. [2] and the maximum likelihood re-estimation on the offset (linear transformed data) of Padmanabhan et al. in order to reduce the number of parameters to be estimated for the new speaker (Kuhn et al. [2], p.697, 2nd ¶) and to bring the new speaker acoustically closer to the training speaker, i.e. to remove speaker-dependent idiosyncrasies (Padmanabhan et al., 2nd ¶ of sect. I, "Introduction") and thus providing a faster and more accurate speaker adaptation method in speech recognition.

Regarding claim 2, Kuhn et al. [1] show:

training speech data (combination of a speaker-independent component and a speaker-dependent component) is separated by identifying context dependent data (adjusted-speaker data) and using said context dependent data (adjusted-speaker data) to identify said speaker independent data (speaker-independent component). See Fig. 2, 30. [The speaker-adjusted data are speaker-independent components of the training speech data.]

Regarding claim 3, Kuhn et al. [1] show:

training speech data (combination of a speaker-independent component and a speaker-dependent component) is separated by identifying context independent data (centroids) and using said context independent data (centroids) to identify said speaker dependent data (speaker-dependent component). See Fig.2, 28. [The centroids are speaker-dependent components of the training speech data.]

Regarding claim 4, Kuhn et al. [2] show:

maximum likelihood re-estimation step is performed iteratively (Fig.1, "ONLINE STEPS"; p.697, col.1, L.9-10 of 1st ¶; p.697, col.2, the ¶ after equation 8).

Regarding claim 5, Kuhn et al. [2] show:

linear transformations are effected as an offsets (speaker-adjusted data) from said centroids (Fig.2, 30). The linear transformation of centroids is met by the centroid subtraction process (col.8, L.14-30)

Regarding claim 7, Kuhn et al. [1] show:

linear transformations of said centroids (adjusted-speaker data) are represented in tree data structures corresponding to individual sound units (Fig.1, 32; col.7, L.52-55).

Regarding claim 8, Kuhn et al. [1] show:

offsets (adjusted-speaker data) are represented in tree data structures corresponding to individual sound units (Fig.1, 32; col.7, L.52-55).

5. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuhn et al. [1], in view of Kuhn et al. [2] and Padmanabhan et al., and further in view of Kuhn et al. [3] (US Patent No. 6,141,644).

Regarding claims 9-10, the modified Kuhn et al. [1] do not show using speaker dependent component to perform speaker verification or identification.

However, Kuhn et al. [3] teach:

using said speaker dependent component to perform speaker verification (Fig.4, 44-58, 62, 64; col.16, L.50-58; col.7, L.10-17).

using said speaker dependent component to perform speaker identification (Fig.4, 44-58, 66, 68; col.16, L.50-58; col.7, L.10-17).

It would have obvious to a person of ordinary skill in the art at the time of the invention was made to further modify the method for developing context-dependent acoustic model of Kuhn et al. [1], Kuhn et al. [2], and Padmanabhan et al. to include speaker verification and identification method of Kuhn et al. [3] in order to perform authentication of the users in application such conducting financial transactions over the telephone (Kuhn et al. [3], col.1, L.10-25).

Allowable Subject Matter

6. Claim 6 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Regarding claim 6, search and analysis of references do not show:

a maximum likelihood re-estimation step that generates a re-estimated low-dimensional space, re-estimated centroids and re-estimated offsets; and

context-dependent acoustic models are constructed using the re-estimated low-dimensional space and the re-estimated offsets.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patent Documents:

A). Gao et al. 06/2000 6,073,096

B). Digalakis et al. 11/1999 5,864,810
C). Kuhn et al. 12/2001 6,327,565 B1
D). Kuhn et al. 01/2002 6,343,267 B1

Other Publications:

E). Hazen et al., "A comparison of novel techniques for instantaneous speaker adaptation," Proc. of Eurospeech97, pp.2047-2050.

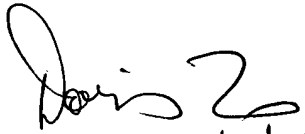
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tim Lao whose telephone number is 703-305-8955. The examiner can normally be reached on M-F, 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doris To can be reached on 703-305-4827. The fax phone number for the organization where this application or proceeding is assigned is 703-305-9508.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9000.

Tim Lao
Examiner
Art Unit 2655

TL
11/6/03


DORIS H. TO 11/17/03
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